

Climate Change

What to think and what to do

2. The Key Systems

We don't inherit the Earth from our ancestors, we borrow it from our children.

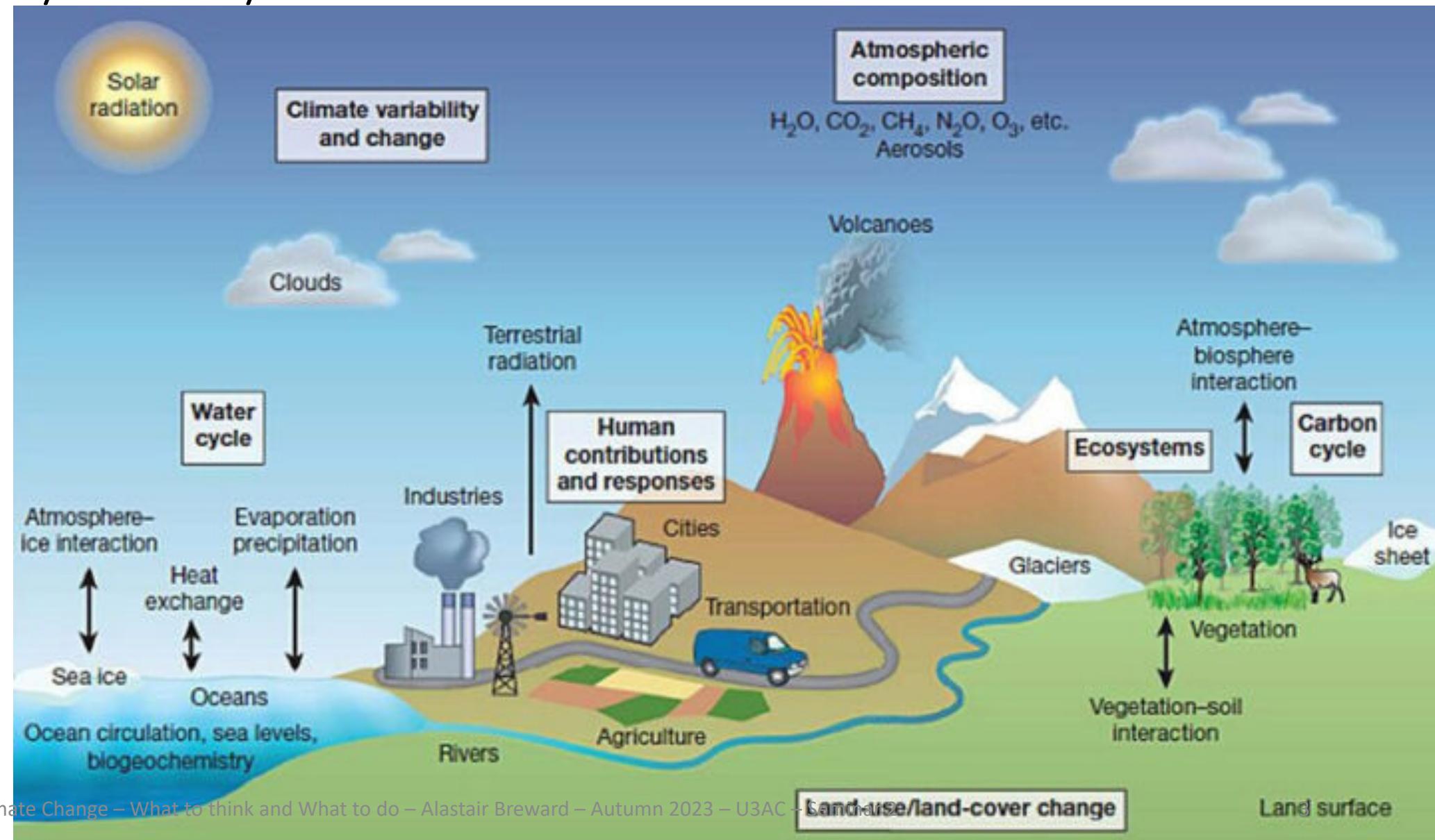
The Key Systems

- The Planetary Climate System
 - How does it work?
 - What is happening?
 - What is the evidence?
- Socio-Political Systems
 - What is climate injustice, and why does it matter?
- Economic Systems
 - Can Capitalism solve this?

The Key Systems

The Planetary Climate System - How does it work?

It's...
complex!



The Key Systems

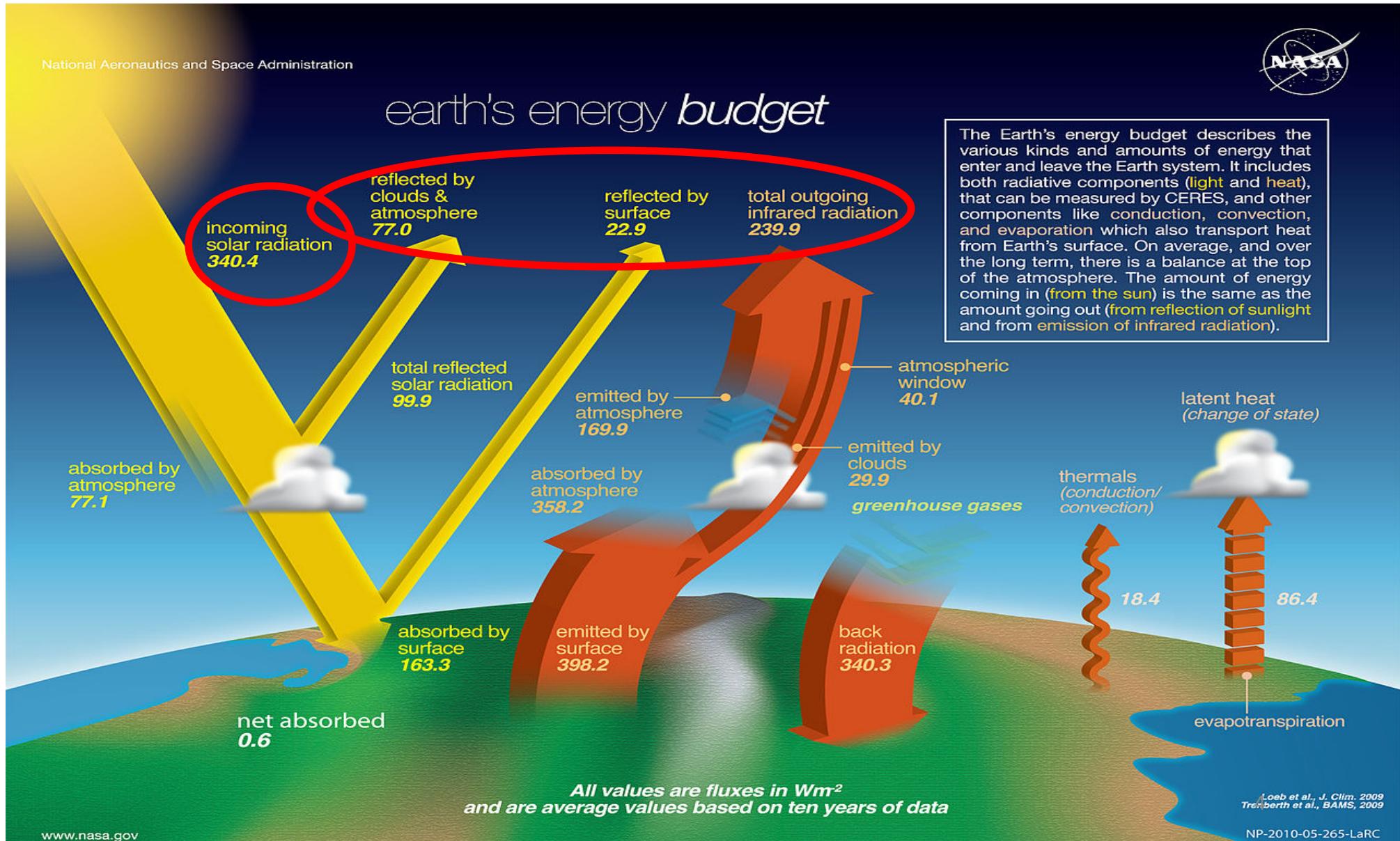
The Planetary Climate System - How does it work?

But the
key is:

340.4 in
339.8 out

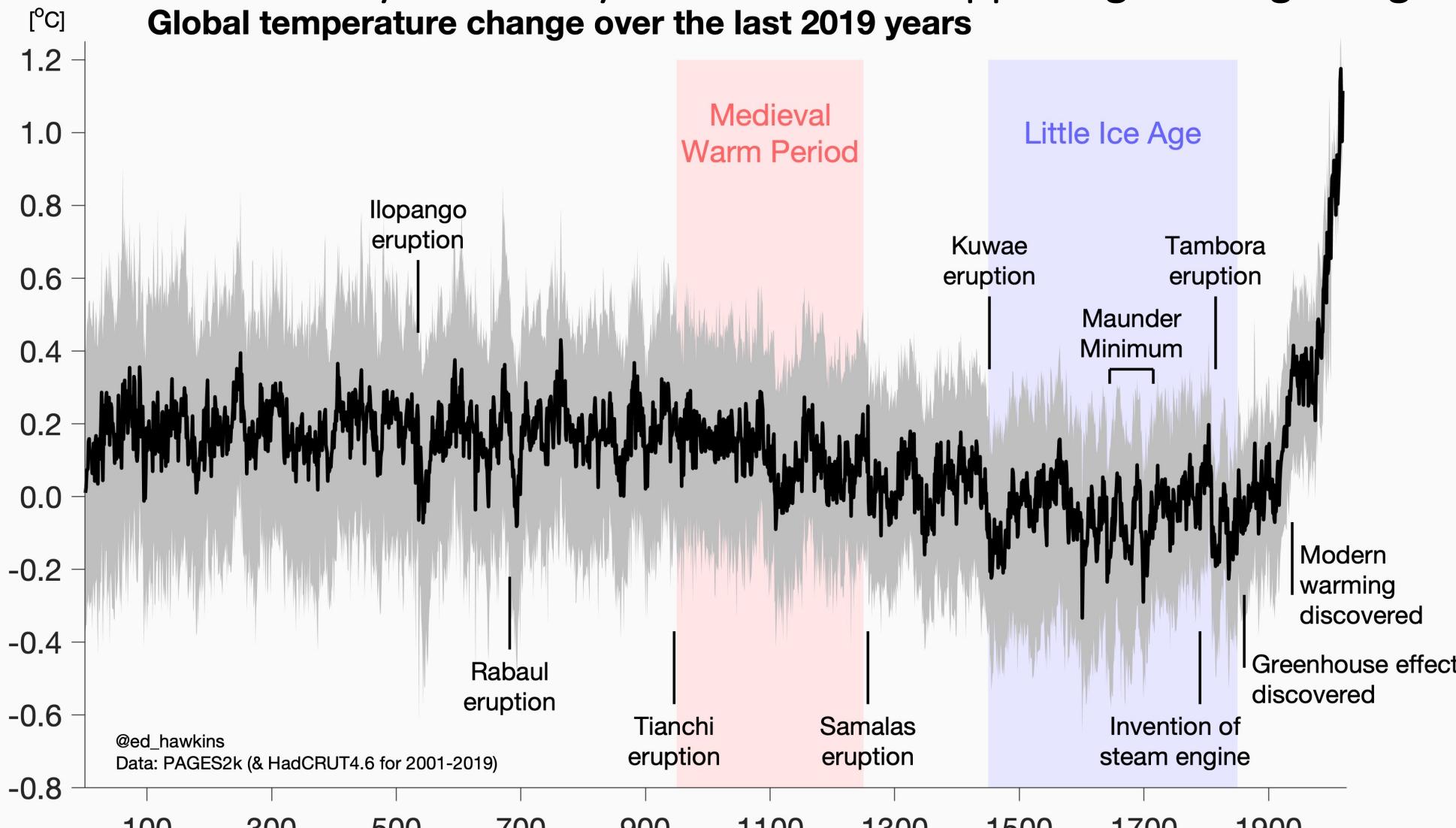
Net:
0.6 IN

About 1KW
per suburban
plot (0.2 acre).
Everywhere
All day
Every day.



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The Planetary Climate System - What is happening? – It's getting warmer!

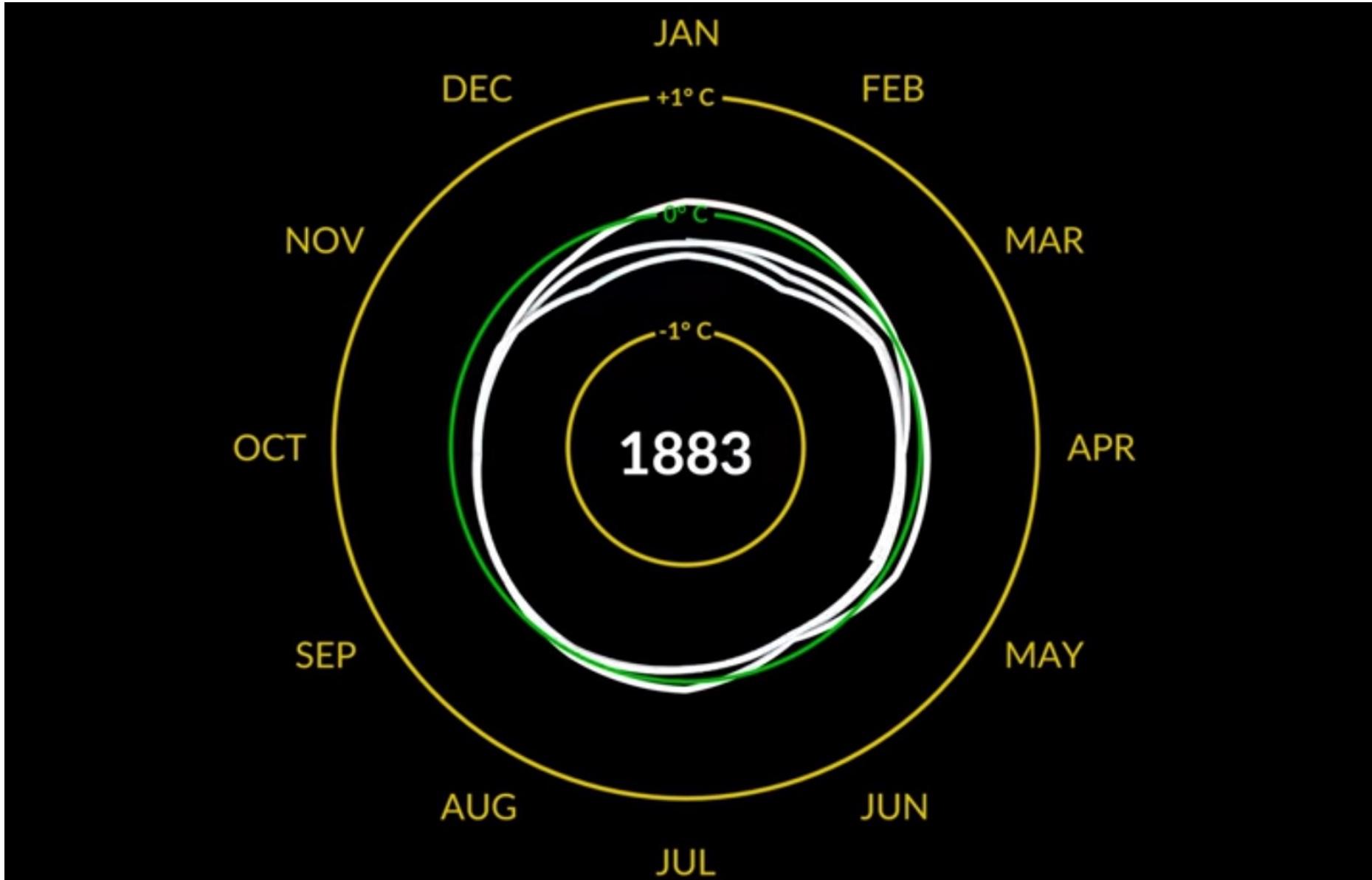


- Medieval warm period, wasn't warmer (globally)
- Eruptions significant but short-term only
 - Though *probably* a clump of 4 eruptions led to..
- The Little Ice Age
 - *Not* sun spots
 - *Might* have been man-made (post-Columbus disease → reforestation)
- There are spikes and troughs, but our spike is... DIFFERENT

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The Planetary Climate System - What is happening? – NASA's 'climate spiral'

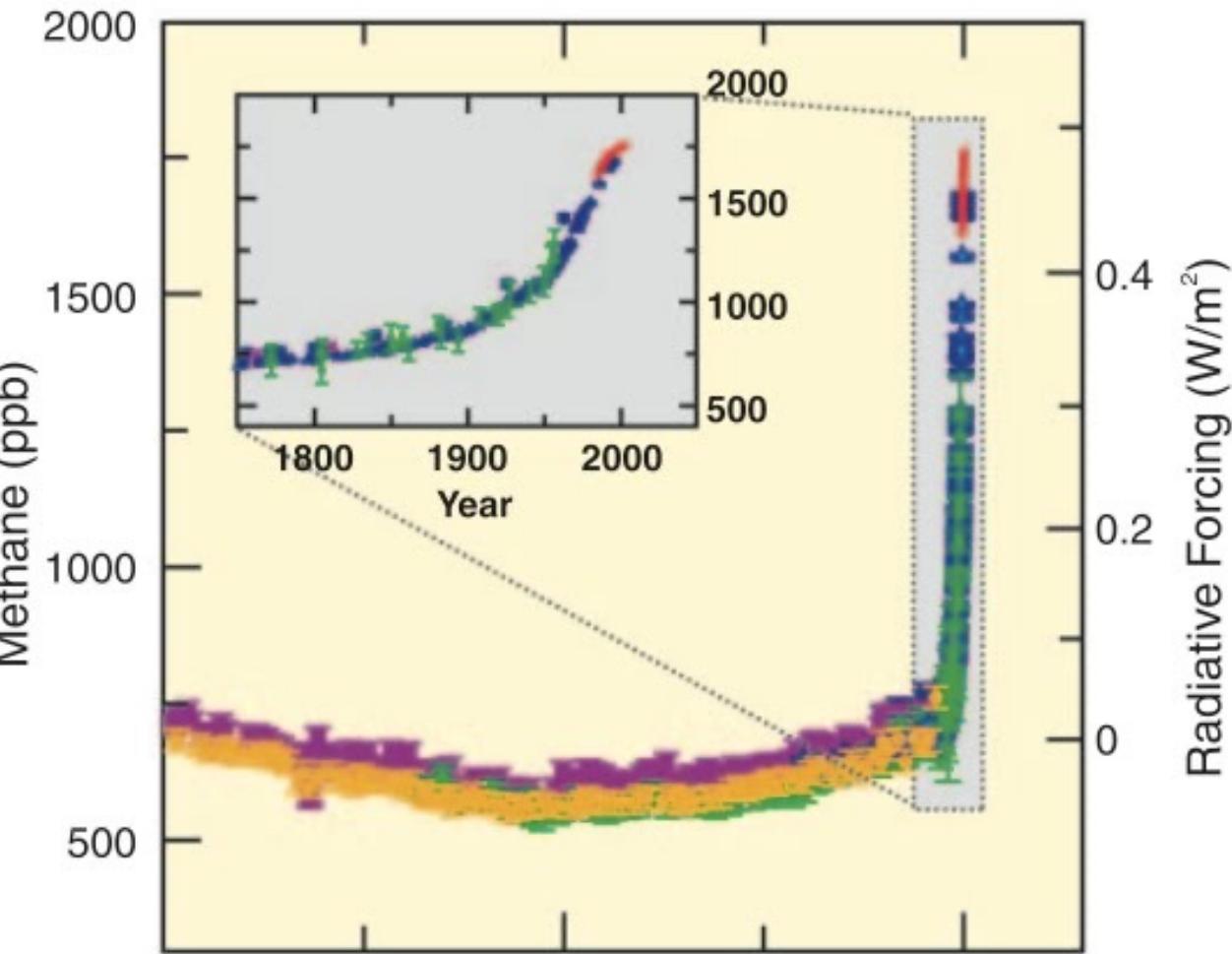
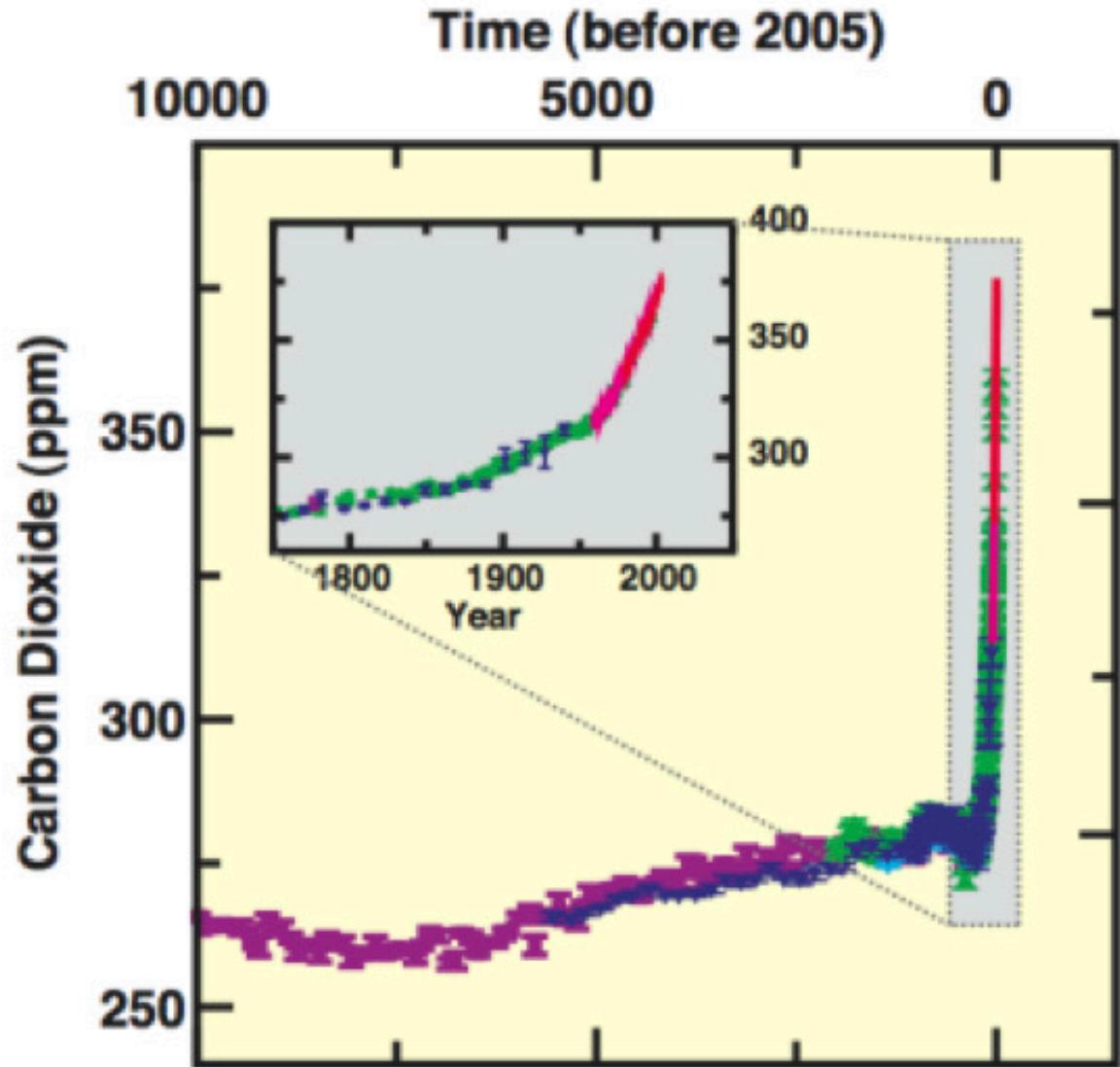
(https://climate.nasa.gov/climate_resources/300/video-climate-spiral/)



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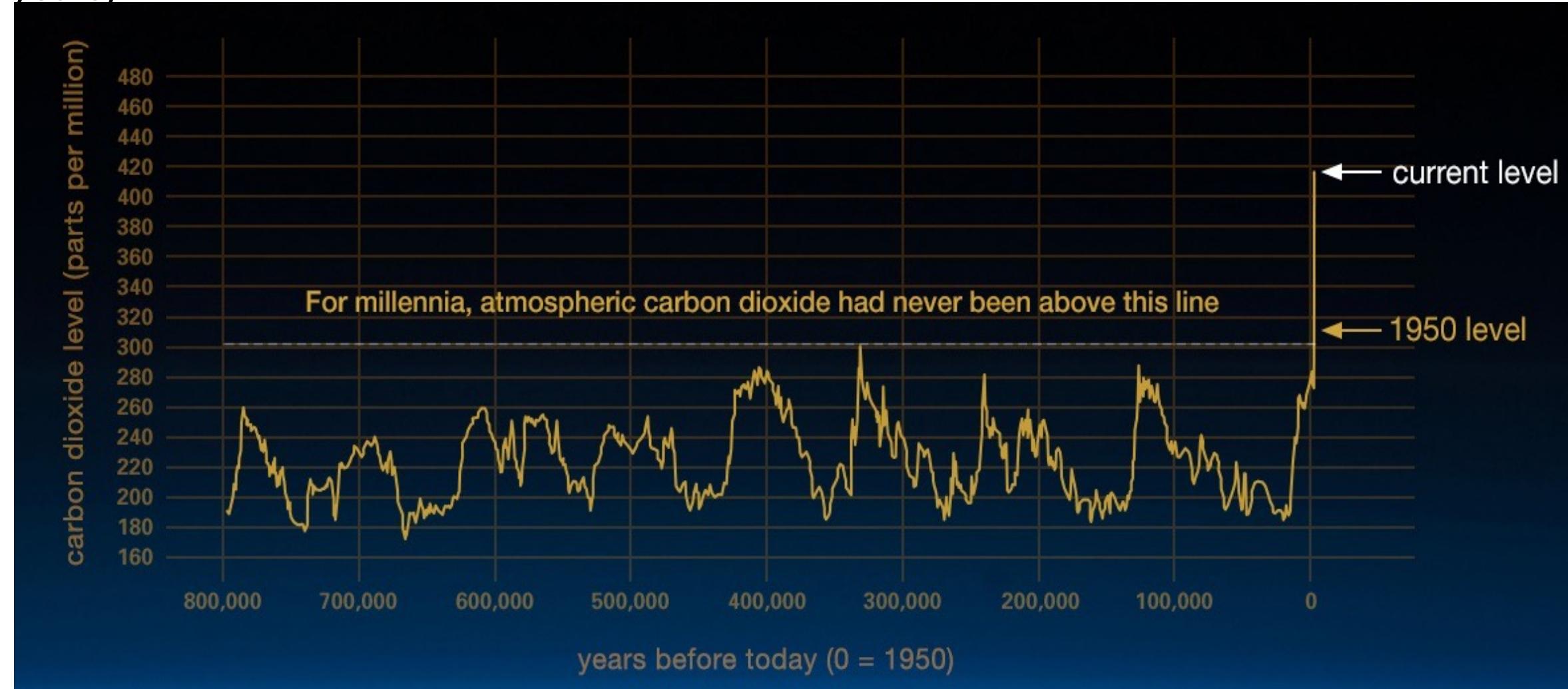
The Planetary Climate System - Why might that be?

So, Temperature and
Greenhouse Gases are
HIGHLY CORRELATED



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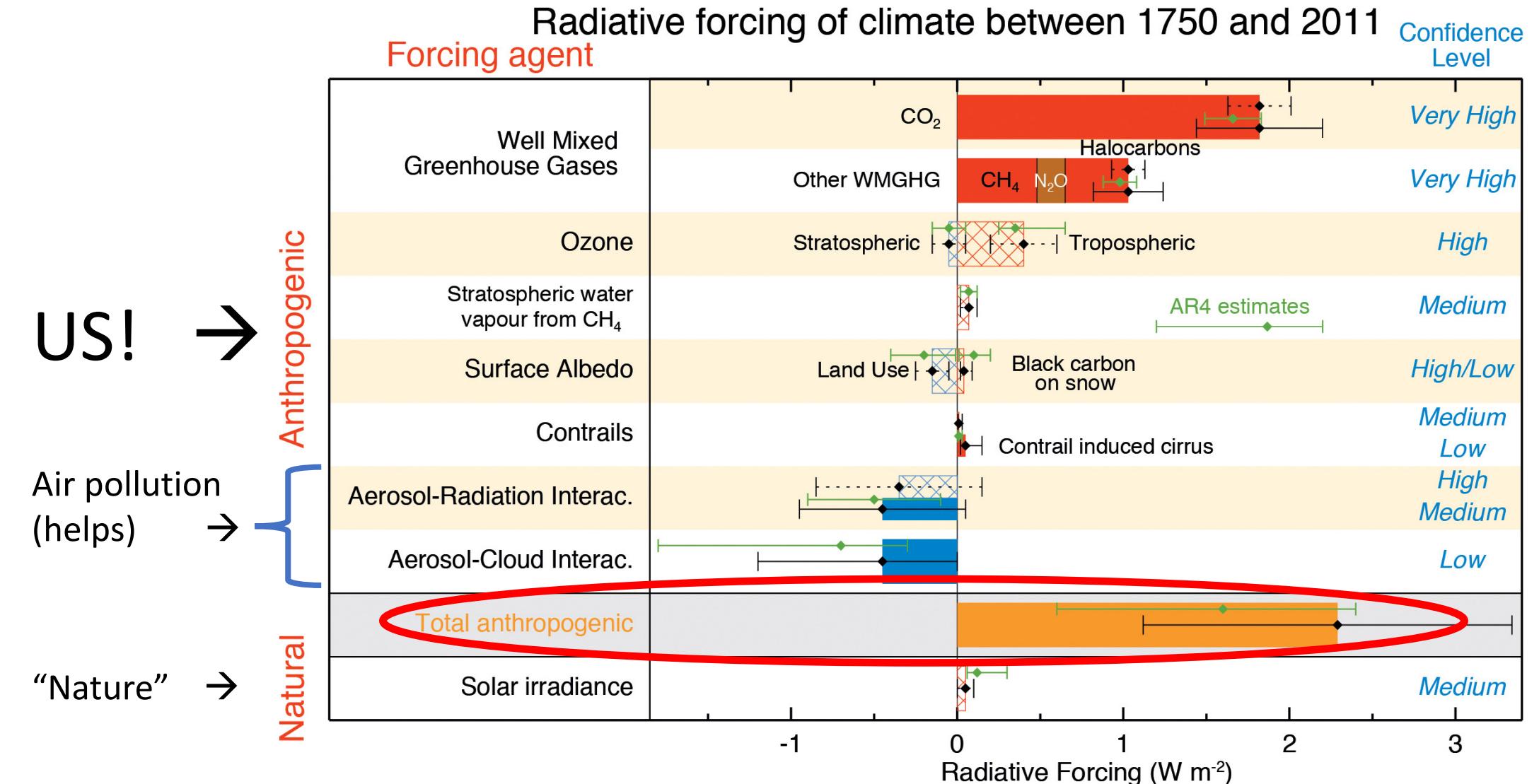
The Planetary Climate System - What is happening? – a longer view of CO₂ (800,000 years)



(Credit: Luthi, D., et al.. 2008; Etheridge, D.M., et al. 2010; Vostok ice core data/J.R. Petit et al.; NOAA Mauna Loa CO₂ record.)

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The Planetary Climate System - What is happening? – Where are the GHGs coming from?



The Planetary Climate System - Summary of what we know

(Will cover more in lecture 3 but..) the IPCC presents six main lines of evidence for climate change:

1. *Unprecedented rise in GHGs since the beginning of the industrial revolution*
2. GHGs do trap heat in the atmosphere
3. Significant rise in global temperature of 0.85°C and sea level rise of 20cm over the past century
4. Sunspots, volcanic eruptions and other natural events cannot explain the overall warming trend
5. There are significant changes in the Earth's climate system, affecting snowfall, sea ice, retreating glaciers, shrinking of permafrost - all consistent with a warming global climate
6. There are significant shifts in weather patterns and an increase in extreme events
 - Some regions wetter, others drier
 - Intense rainfall has become more frequent, along with major flooding
 - More heat waves
 - The 13 warmest years on record have all occurred within the past 16 years

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Socio-Political Systems - Where is this heading (for Humanity)?

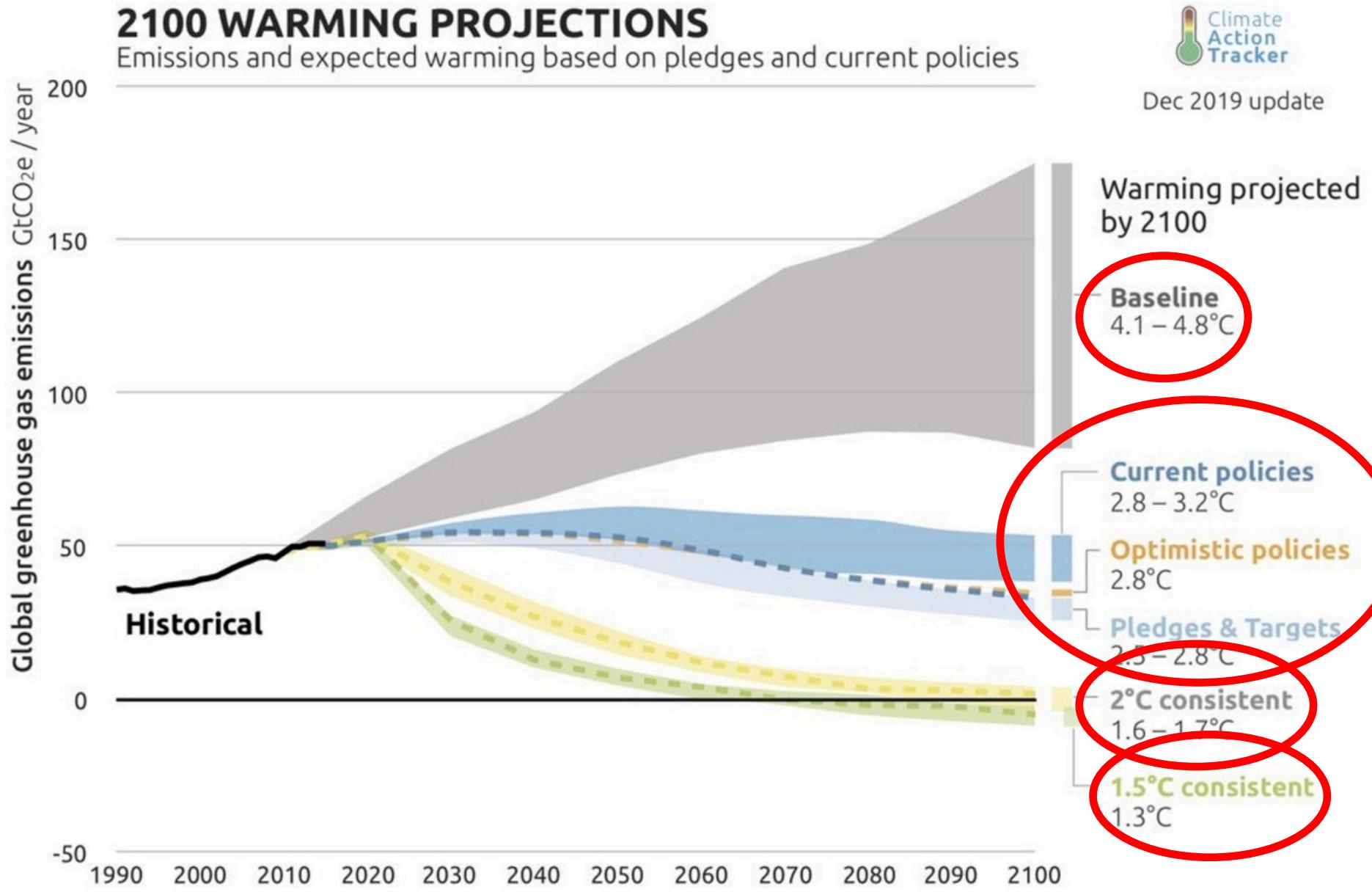
It depends....

Annihilation

Extreme misery

Stress & Mess

Containment



The Key Systems

Socio-Political Systems – other interactions with The Planetary Climate

Climate (heating) also directly drives other problems:

- Sea level rise from melting ice
- Ocean acidification → sea food shortages
- Drought, soil damage → land food shortages

And Humans help along many more:

- Biodiversity loss, deforestation
- Over-fishing
- Aquifer depletion
- Pollution (water, air, esp plastics)

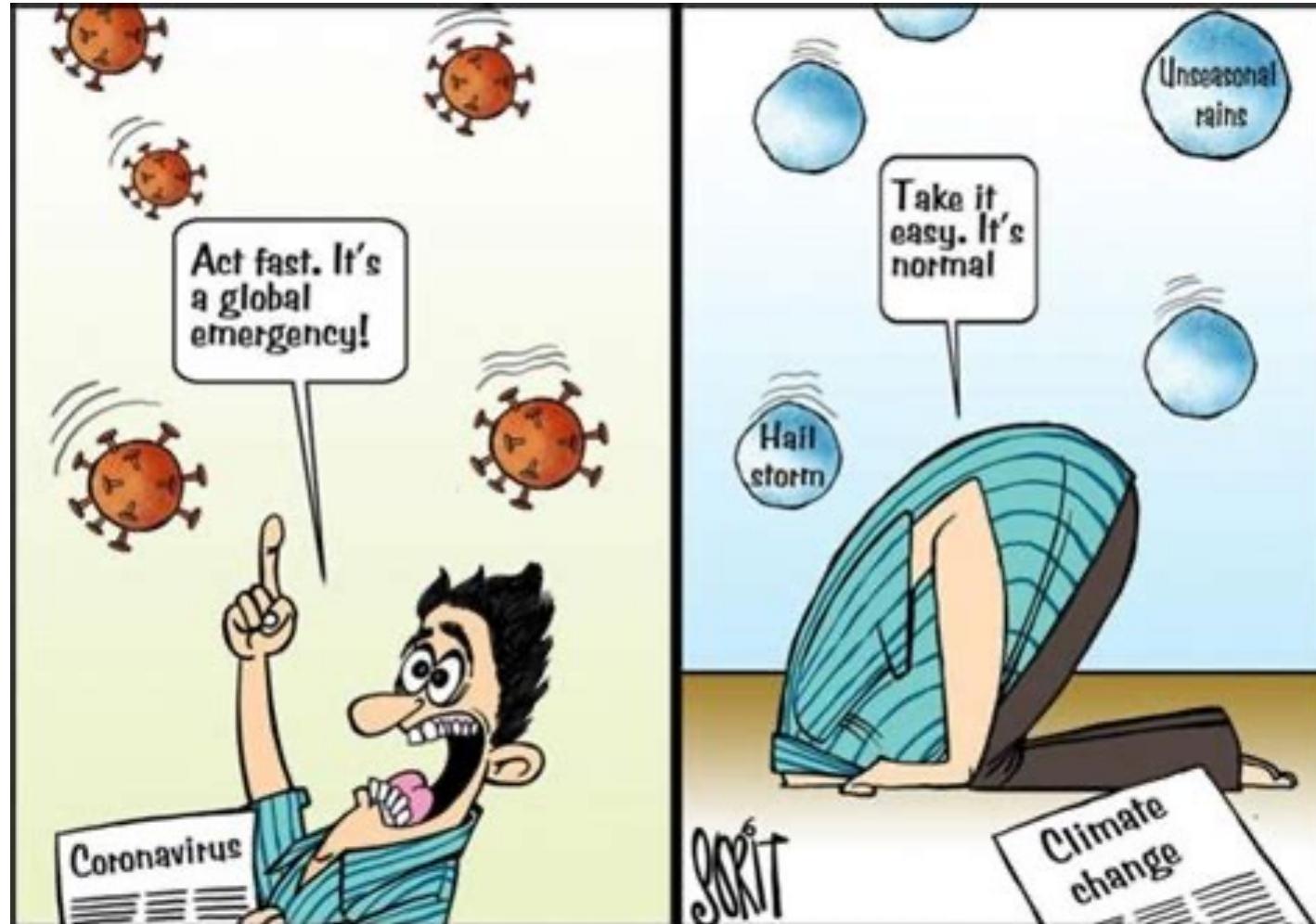
And choose ways of life that further exacerbate:

- Unbridled Consumption/fast fashion
- Food waste, meat-eating

See: [13 Biggest Environmental Problems Of 2022 | Earth.Org - Past | Present | Future](#)

The Key Systems Socio-Political Systems - Urgency

- Urgency vs importance
 - Covid-19 as example of what's possible when urgency joins importance
- How much time do we have?
- Who is it affecting and who might escape?



Socio-Political Systems - Urgency

- How much time do we have?
 - That depends on how much we do, and what we regard as acceptable loss
 - If we want to prevent *any* species going extinct, and *some* human communities being damaged, we are already far too late
 - The effects are already being felt
 - Climate breakdown is a supertanker; even if we activate all solutions, it will get worse first
 - So it's not a binary thing, it's a spectrum
 - What we are being told is that failure to make drastic change over this decade (already nearly 1/3 over..) will risk tipping points
 - Causing run-away change that we will struggle to contain or prevent
 - I.e. in 10 years time, efforts may become futile.
 - Plus, even if the scientists are totally wrong, “do you feel lucky”?
 - Surely spending a few percent of our assets on insurance is just prudent?
 - So we'd better start now

The Key Systems

Socio-Political Systems – Who is affected?

- Bankruptcy happens “slowly, then suddenly”
- Likewise, climate breakdown, in 3 different ways
 - Slowly then suddenly, in *time*
 - To a few, then suddenly *many*
 - Faraway, then suddenly *near*
- Naomi Klein speaks of ‘Sacrifice Zones’
 - E.g. The Niger Delta, Nauru, the North Atlantic Gyre, local coastal fishermen
 - But some externalities can’t be contained (air pollution)
 - And eventually, you need to expand or add new Sacrifice Zones
 - And finally, everything is sacrificed
 - *“Only when the last river is poisoned and the last tree felled will we realise we can’t eat money”*
- Will the UK be alright?
 - Well, in a way. Better placed than many. But...
 - When one, or two, *billion* people cannot thrive where they are, they will move. Today’s ‘immigration’ problems will pale in comparison
 - If the Atlantic Meridional Overturning Circulation (AMOC) slows, we’ll notice..

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Socio-Political Systems – Who is affected

Melt water from the Arctic/Greenland may disrupt the Gulf Stream

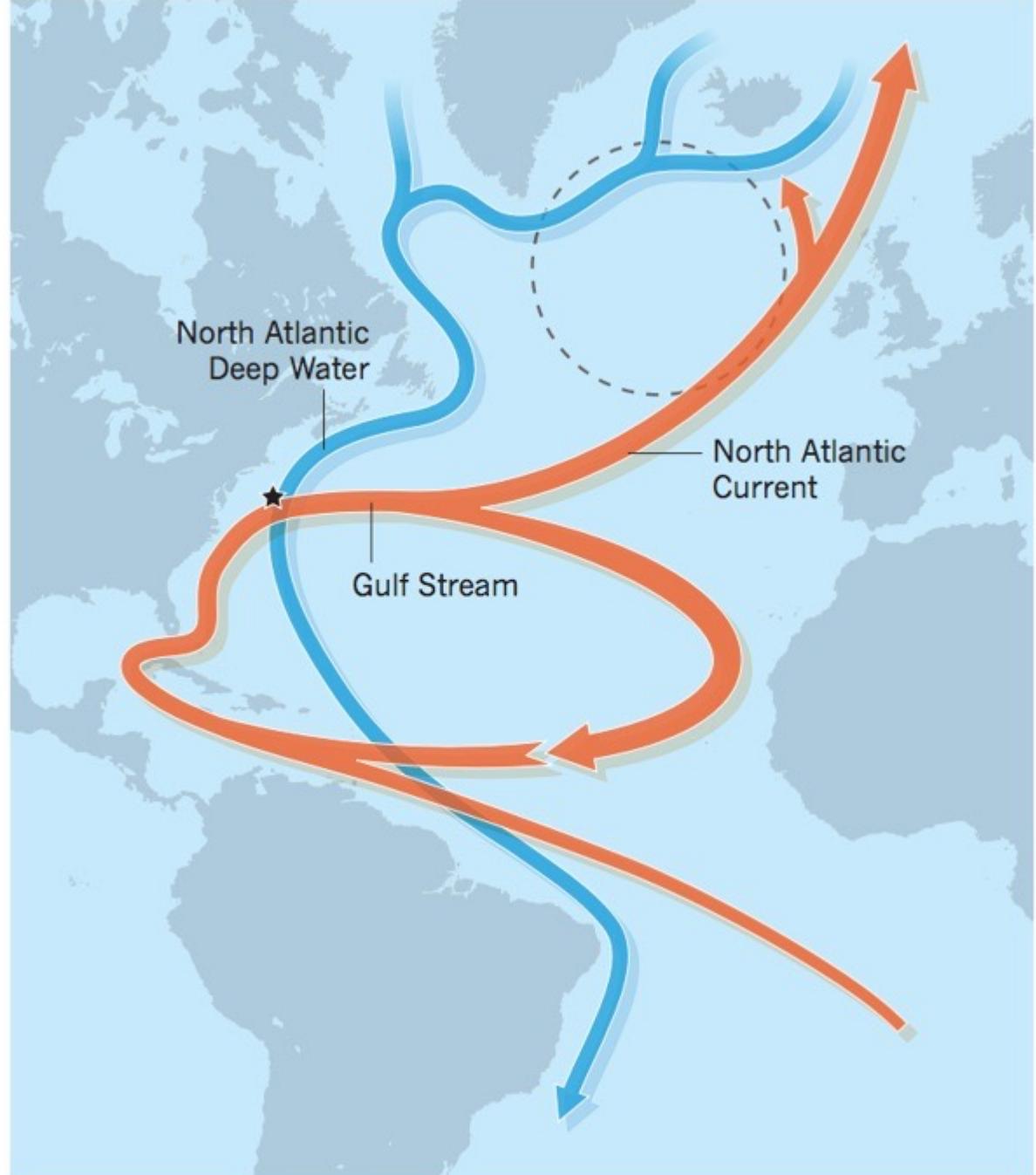
Without it, the UK's winter average may *drop* 5 deg C

Lucky again? This might cancel out AGW for us...

Maybe...

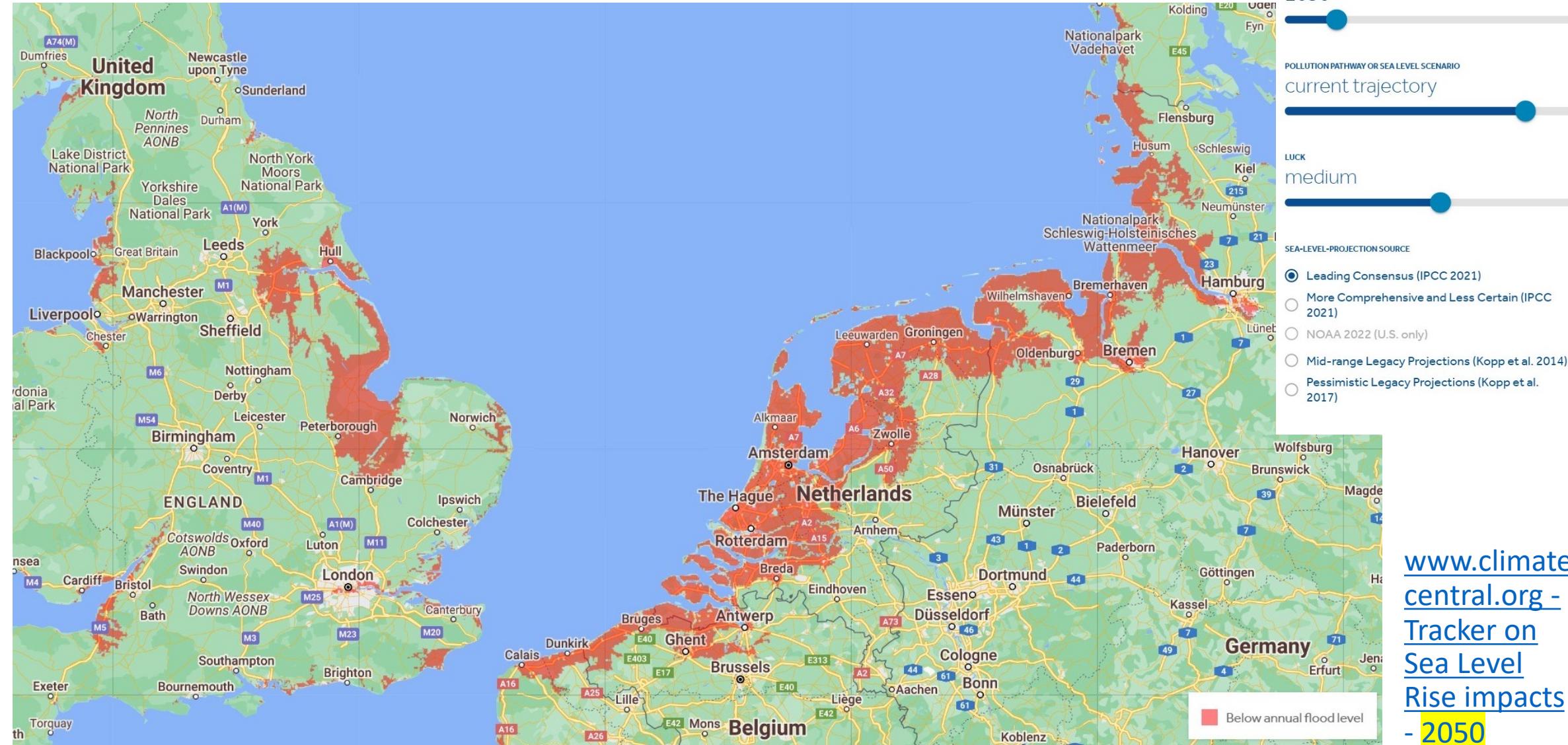
NB. The whole world's population can (very nearly) stand on the Isle of Wight.

They might all want to test this!



The Key Systems

Socio-Political Systems – Who is affected? – Sea Level Rise



The Key Systems

Socio-Political Systems – Who is affected?

And that brings us to...

Climate Justice!

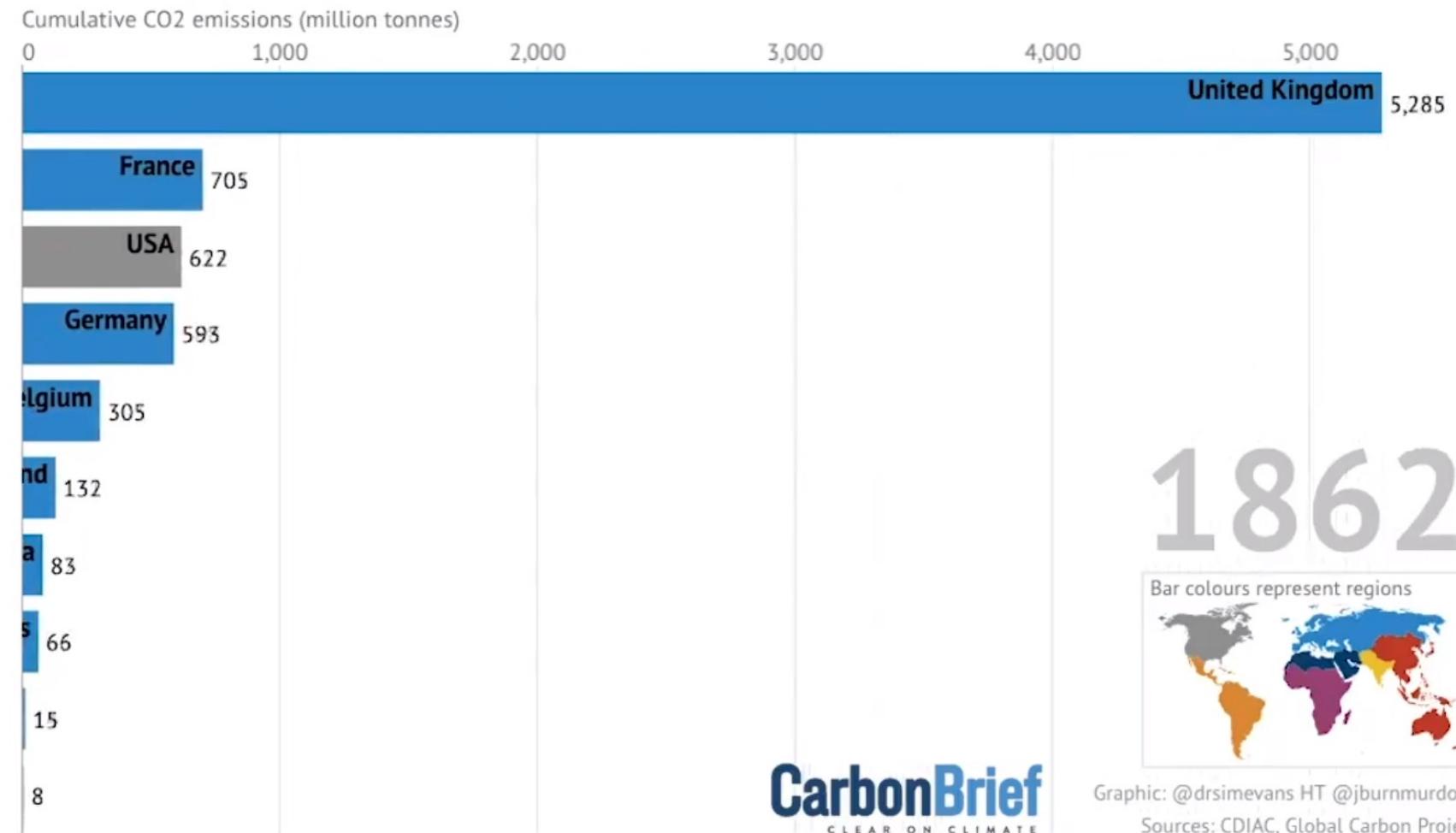
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Socio-Political Systems – Climate Justice history

Reminder: CO₂ stays in the atmosphere for hundreds of years, so historic contributions are still ‘active’.

- UK above 50% of *global* until 1882
- UK biggest till 1912
- 2nd biggest till 1975
- China into top 10 1956
- UK overtaken by China 1999

The countries with the largest cumulative CO₂ emissions since 1750



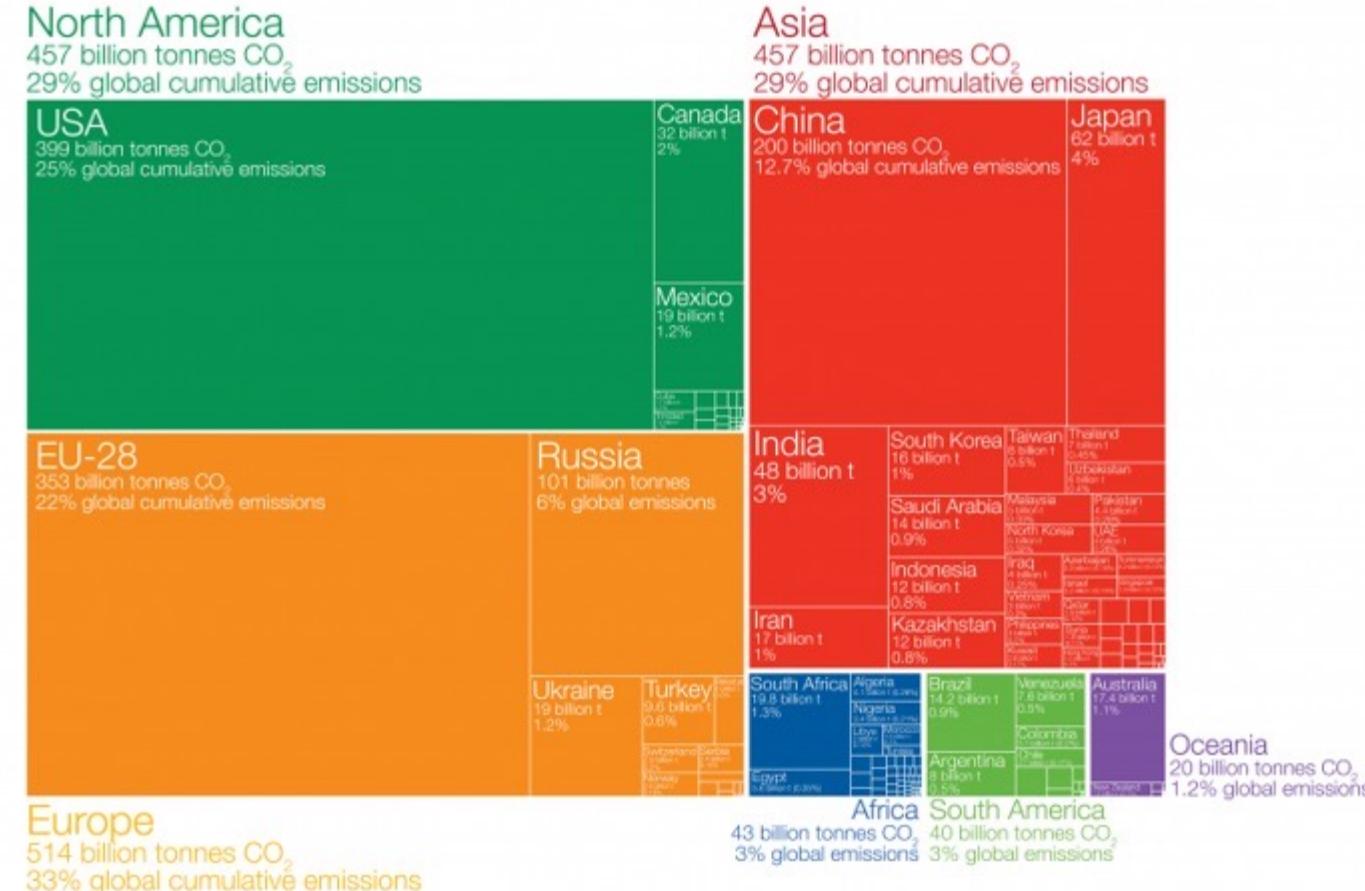
Socio-Political Systems – Climate Justice history

Since the start of the industrial revolution, in 1751, the countries that are now the US and the European Union have generated 47% of the world's total carbon emissions, while combined, all of Africa and South America produced just 6%.

(About the same as the UK alone...)

Who has contributed most to global CO₂ emissions?

Cumulative carbon dioxide (CO₂) emissions over the period from 1751 to 2017. Figures are based on production-based emissions which measure CO₂ produced domestically from fossil fuel combustion and cement, and do not correct for emissions embedded in trade (i.e. consumption-based). Emissions from international travel are not included.



Figures for the 28 countries in the European Union have been grouped as the 'EU-28' since international targets and negotiations are typically set as a collaborative target between EU countries. Values may not sum to 100% due to rounding.

Data source: Calculated by Our World in Data based on data from the Global Carbon Project (GCP) and Carbon Dioxide Analysis Center (CDIAC). This is a visualization from OurWorldInData.org, where you find data and research on how the world is changing.

Licensed under CC-BY by the author Hannah Ritchie.

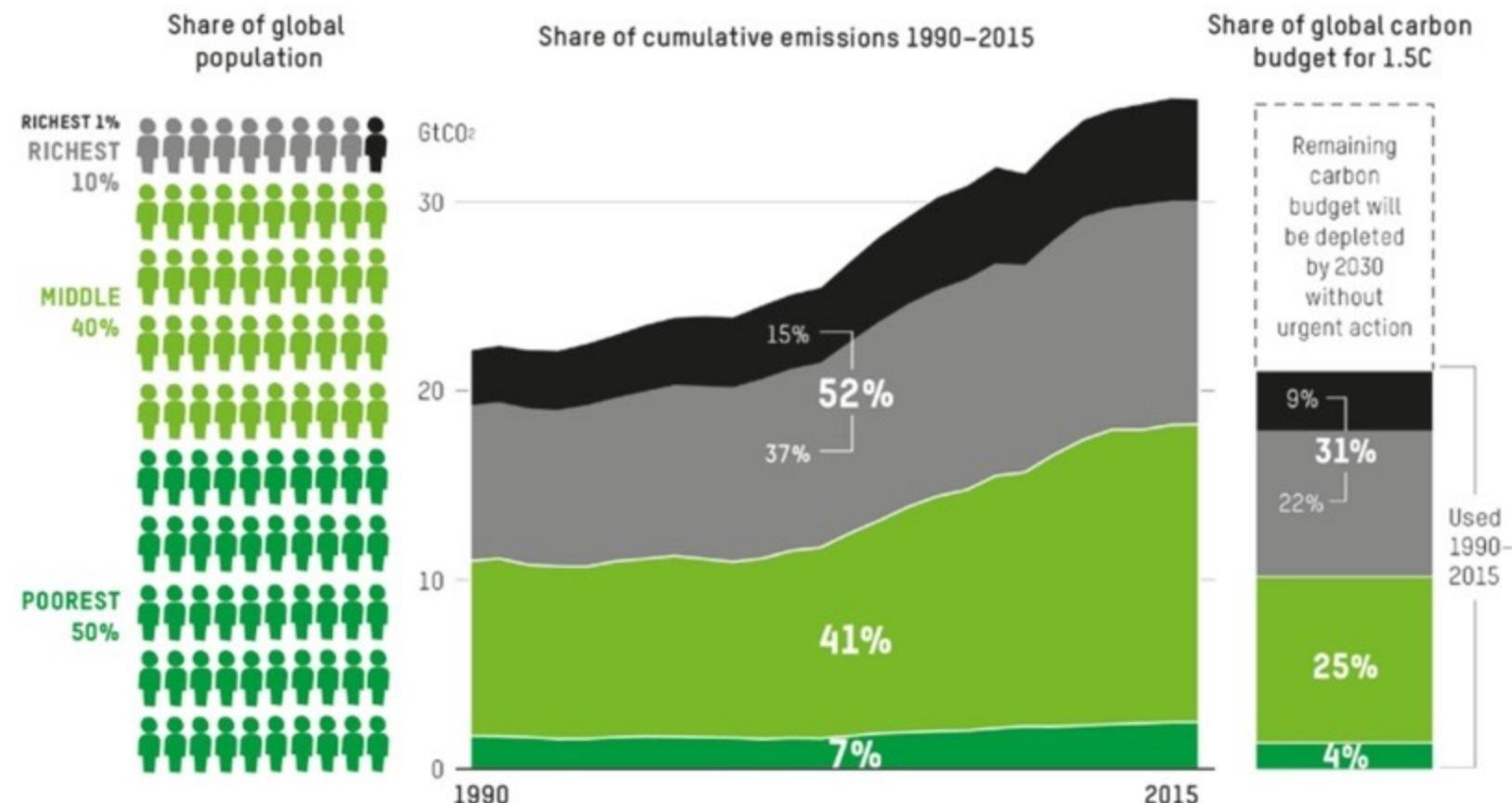
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Socio-Political Systems – Climate Justice – “Now”

Researchers estimate that in the past 30 years:

- emissions by the poorest 50% of world citizens grew hardly at all (7% of global emissions)
- the wealthiest 10% are responsible for 52% of cumulative global emissions
- the ‘top’ 1% emitted 15%
- Today, 3 billion people on the planet use *less energy each year than the average American fridge*

Figure 1: Share of cumulative emissions from 1990 to 2015 and use of the global carbon budget for 1.5C linked to consumption by different global income groups



Source: <https://oxfamlibrary.openrepository.com/bitstream/handle/10546/621052/mb-confronting-carbon-inequality-210920-en.pdf>

Socio-Political Systems – Climate Justice – a worked example

- Hurricane Katrina, as a case study of so-called “Disaster Capitalism”
 - The Levies should have worked, but didn’t
 - Because they mainly defended poor neighbourhoods
 - At a time when the zeitgeist was (and had long been) “Shrink the Govt”
 - The better off left town, used hotels, and called insurers
 - Those without options, waited for aid
 - 1,000 died waiting, 23,000 in the Superdome were 5 days without food or water
 - The aid was slow and chaotic
 - Political polarisation → loyalty not competence or experience
 - Those in charge saw the affected as feckless scroungers
 - So the stranded waited, using up their own meagre resources. When gone, they went in search. Without pay, and with shops closed, they couldn’t buy, so they took.
 - Now they were seen as dangerous looters as well as scroungers. (“You loot, we shoot”)
 - Aid resources were switched to ‘defending’ wealthy neighbourhoods
 - Redevelopment
 - Was done, but to big contractors
 - With little and poor oversight
 - Who didn’t hire locally (the homeless, jobless victims) – instead they used cheap labour (often immigrant)
 - Much public housing (without flood damage) was demolished – those renting them weren’t consulted and couldn’t afford the newer better housing
 - Other social services were slashed (by \$40bn) to pay for this contractor bonanza

Socio-Political Systems – Climate Justice: Intergenerational Injustice (dull label, massive issue)

• Triple whammy:

- Children are more *vulnerable* than adults (90% of CC diseases affect those under 5 yrs old)
- Children have *no legal standing*, we hold their rights for them. We are supposed to exercise those rights for their good, not ours. But mainly:
 - They'll *inherit our mess (and despise us for it)*
- What right do we boomers have to burn all the remaining Carbon budget over the next 8 years?
 - Because we're still 'in power', and that's the rate we're going (and it's still RISING)
- Younger people are damaged by uncertainties we never faced
 - Not all are climate-related (tech etc) BUT
 - 4 in 10 young people (16-25) fear having children
 - Many see little point in planning far ahead – 75% say the future is "frightening"^{*}
 - And those are the ones in rich countries, not in the Zones already 'sacrificed'.
- As for the impacts *specific to Climate Breakdown* on those outside the rich world^{**}:
 - Almost *160 million* children are already exposed to high severe and prolonged droughts.
 - The education of around 38 million children is disrupted each year.
 - By 2040, it is estimated that *one in four* children will be living in areas with extreme water shortages
 - By 2050, an *extra 24 million* children will be undernourished
 - By 2050, there could be *143 million* more migrants
 - Migration destroys parental bonds, family links to community, and agency

^{*}[Four in 10 young people fear having children due to climate crisis | Climate crisis | The Guardian](#)

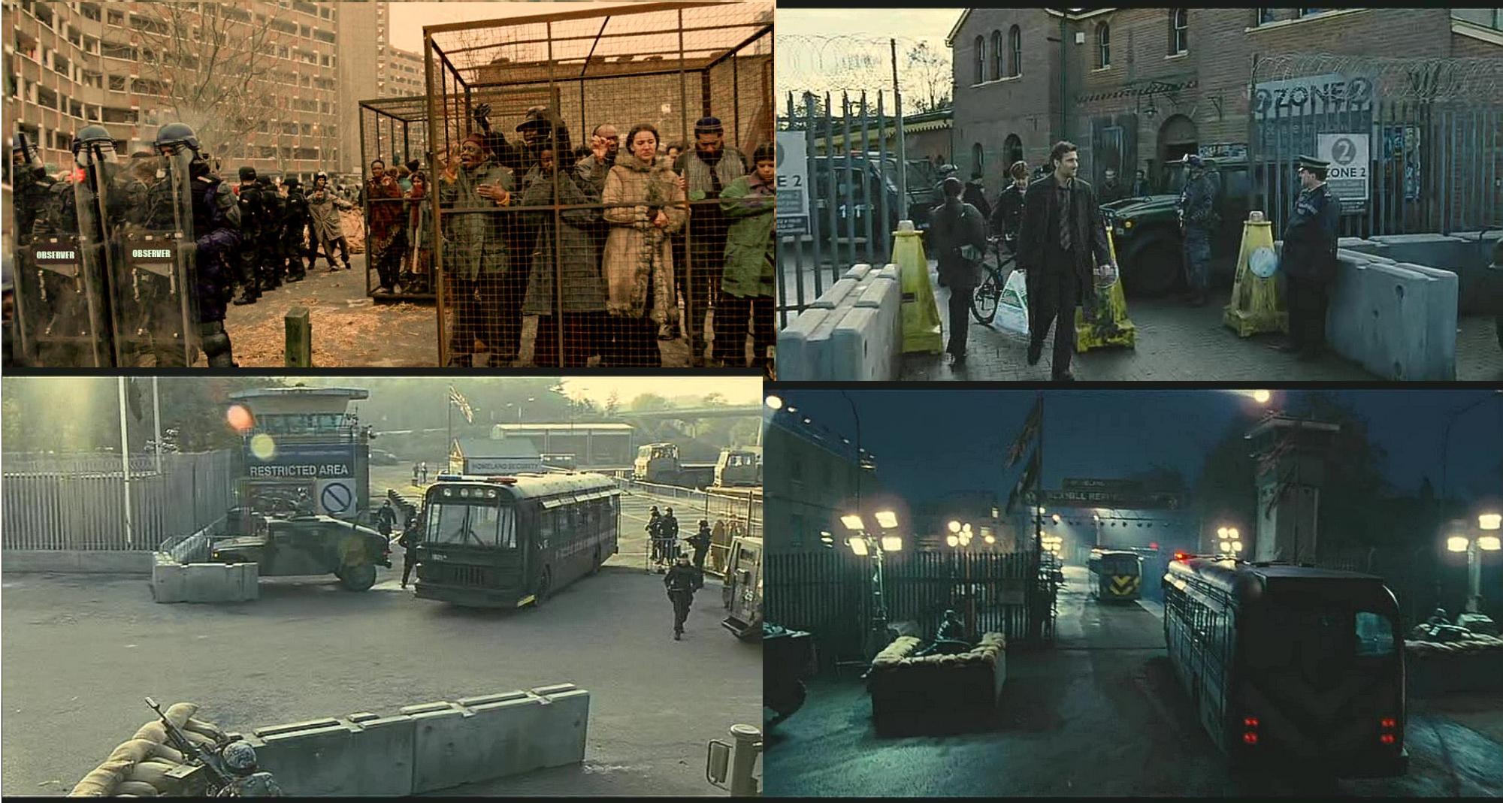
^{**}[Effects of Climate Change on Future Generations | Save the Children](#)

Socio-Political Systems – Climate Justice – why should we care?

- There's the moral argument from *history*
 - We did this
 - Others are paying
 - We can afford it, they can't
- Plus the moral arguments about *fairness* (rich vs poor, old vs young)
 - It's the rich who get the profits, it's the poor who get the blame
 - Katrina was just inside one country
 - But national borders aren't relevant, and usually the affected poor live far away
 - Destruction of a viable future for our children
- And the *pragmatic* arguments
 - Relying as we do on global supply chains for food, energy, minerals etc
 - Can we expect to just carry on regardless?
 - Will the supply chains fail?
 - Can we really insulate ourselves from catastrophes playing out abroad?
 - Do we want to see a couple of billion people moving due to climate damage?
 - Can we seriously expect to keep everyone out of our land?

The Key Systems

Socio-Political Systems – Climate Justice – Dystopian Futures



Children of Men 2006 (based on P. D. James' 1992 novel)

The Key Systems

Economic Systems – Can Capitalism solve this?

I have been a believer in free market capitalism (FMC) most of my life, because:

- It has been THE driver of much progress over the past 300 years
 - Making hay with Fossil Fuels, that fabulous store of concentrated, light, easily released energy
- It's responsible for *huge* advances across multiple domains – health, transport, comfort, entertainment, ..
- There is *no obviously better system* for allocating resources efficiently

BUT, the danger is that we forget things:

- There ARE other options - it wasn't always thus, and even now isn't everywhere thus
- Capital accumulates in *ever fewer hands*, who thus acquire huge and largely *hidden power* (media barons, corporate cash in politics, greenwash PR agents), which they use to *promote the status quo* as 'the best of all possible worlds'
 - They care for the hindmost *only* to the extent they're needed (manufacturing, fighting), or get uppity
- Free markets are never free – there is *always* a set of people who set the rules (to someone's advantage..)
- And they are bad at some things (natural monopolies/network effects, and pricing eco-damage & pollution)
- FMC is built on assumptions that worked really well *in the past*
 - Nature is our servant, without secrets from us (cf. DDT)
 - Nature shrugs at us, no matter what we do to it
 - Resources are inexhaustible
 - Pollution can be absorbed without limit
- These assumptions are no longer true

AND

- FMC appears to *reward* and *require* endless (and otherwise pointless, to FMC) growth, and manufactured needs.

The Key Systems

Economic Systems – Can Capitalism solve this?

So, I am *no longer* a believer in FMC.



It seems our choice may well be: “change or die”.

Economic Systems – Can Capitalism solve this?

Can we achieve the changes needed *within* the current politico-economic system?

- GDP is a terrible yardstick (counts bombs but not stable marriages)
- Happiness/wellbeing don't correlate to income (beyond c. USD15k/yr)
- Capitalism
 - Drives consumption *directly*, well-being *only indirectly* (if at all – FMC doesn't care)
 - Sniffs out opportunity, then the imperative is to create *barriers*
 - Find an unserved (or poorly served) need, and meet that need, better or cheaper ☺
 - But then
 - Block others trying to meet it ☹
 - Drive down your costs, which means...
 - Always seeks to evade paying for externalities (resource damage, pollution)
 - Always seeks to evade fair tax
 - Is *indifferent* to inequality, and whether pay is fair – in fact, it prefers powerless people
 - Is always on the hunt for *new* needs ☹
 - Hence advertising/marketing
 - FAR BEYOND: “here's a great new thing” ☺
 - AND MOSTLY NOW: make people dissatisfied, show them something ‘better’ ☹
 - So who cares if products don't last? Neither producers, nor consumers! ☹
 - This means *Planned Obsolescence* – where you make sure your product will *generate* new demand

Economic Systems – Can Capitalism solve this?

Maybe (in anything like its current form) Capitalism's time has come to its natural end??

"I beseech you, in the bowels of Christ, think it possible you may be mistaken."

Oliver Cromwell

Capitalism is killing the planet – it's time to stop buying into our own destruction

- *"Instead of focusing on 'micro consumerist bollocks' like ditching our plastic coffee cups, we must challenge the pursuit of wealth and level down, not up"*

George Monbiot

The Key Systems Recap on Systems

- The climate is warming
- It's fast and unprecedented
- We are the primary cause
- A warmer climate *is already* causing disruption, and will cause *increasingly severe* (even catastrophic) disruptions
- The impacts on biodiversity are becoming calamitous, and lethal to humanity
- The injustice is huge, unconscionable, and *will* catch up with us too
- We have gone to sleep, accepting “free market” capitalism because it’s part of the furniture
 - We may need to move away from (or *radically* restructure) it
- Much is already lost, but not all!
- We must do everything, now (if only as insurance)